TH1042 (US)

AFFIDAVIT UNDER C.F.R. 1.132

I, THOMAS MIKUS, being duly sworn, depose and state as follows:

I am an employee of Shell Global Solutions, an affiliate of Shell Oil Company, a corporation organized and existing under the laws of the state of Delaware, having a place of business at One Shell Plaza, 910 Louisiana, Houston, TX 77252.

I have a BS degree and an MS degree in Mechanical Engineering from Massachusetts Institute of Technology. I also hold a PhD in Mechanical Engineering from Massachusetts Institute of Technology, with a thesis in combustion.

I have had twenty-one years experience in corporate research laboratories with Shell Oil Company and/or its affiliates, including six years in the combustion department, and five more years leading the combustion team. In addition I had five years experience in Exxon Research and Engineering's corporate research laboratories.

I am the sole inventor of the invention described and claimed in U.S. 5,255,742, and a co-inventor of the invention described and claimed in the above-identified U.S. Patent Application Ser. No. 09/168,770, filed October 8, 1998.

I invented the flameless combustion heat injector disclosed in U.S. Patent No. 5,255,742 (the Mikus reference) to provide heat to a well drilled through rocky materials. The heat injector was developed to replace electric line source heaters. Because rocky materials are very poor conductors of heat, I viewed the heat injector in my earlier patent

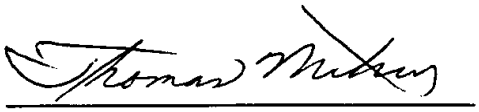
as a uniform, low flux, linear heat source, that typically provided only about 375 Watts per foot of length along the well.

In contrast, endothermic chemical processes of the type heated by the flameless distributed combustion (FDC) process heater disclosed in U.S. Serial No. 09/168,770, require significantly greater amounts of heat, since the flowing process streams normally carry the heat away from the heat source much faster than the rocky materials in a subterranean formation. Process streams typically absorb an order of magnitude higher heat flux than that produced by a heater of the same diameter as the well in my earlier patent. For example, to provide heat at a constant temperature to a process for the production of ethylene by the thermal cracking of hydrocarbons could require a profile of heat flux varying with distance from 3,500 to 7000 Watts per foot, as compared to the 375 Watts per foot provided by the heat injectors of my earlier invention.

Because of the significantly higher heat flux requirements of chemical process streams, the applicability of the flameless distributed combustion heat injectors to chemical process applications was unforeseen and not predictable. It was more than a decade after my original invention, that I and my co-inventors built a new rig to test a flameless distributed combustion heater design for a chemical process. Until these tests were conducted we had no way of knowing whether the FDC concept would work in a chemical process application. That fact that the new FDC process heater worked as well as it did was very surprising to us and quite unexpected.

This Affidavit is made with the knowledge that the United States Patent Office will rely on information provided therein, and that willful false statements are punishable by fine or imprisonment or both, under §101 of Title 18 of the United States Code, and

that such willful false statements may jeopardize the validity of the application at bar or any patent issuing thereon.



THOMAS MIKUS